FIELD SAMPLING PLAN
FOR THE
BECK'S LAKE HEALTH RISK SITE ASSESSMENT
SOUTH BEND, ST. JOSEPH COUNTY, INDIANA

REVISION 0

Prepared for

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region V

Prepared by

WESTON SOLUTIONS, INC.
Region V Superfund Technical Assessment and Response Team

June 10, 2013

Approved by: _____ Date: _____
U.S. EPA Region V
On-Scene Coordinator

Project Dates of Sampling:	June 11 - 13, 2013
CERCLA Site/Spill Identifier No.:	IND980904379
Contractor Organization:	Weston Solutions, Inc.
Contract Name:	START III
Contract No.:	EP-S5-06-04
Technical Direction Document No.:	S05-0008-1305-021
Document Control No.:	2161-4H-BHHL

ACRONYM LIST

ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
COC	chain-of-custody
FSP	Field Sampling Plan
GPS	Global Positioning System
HASP	Health and Safety Plan
HQ	Hazard Quotient
IDEM	Indiana Department of Environmental Management
Mg/kg	milligrams per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RML	Removal Management Levels
SOP	Standard Operating Procedure
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
WESTON®	Weston Solutions, Inc
XRF	X-Ray Fluorescence Device

TABLE OF CONTENTS

Section **Page**

1. INTRODUCTION....1

2. PROJECT MANAGEMENT AND FSP DISTRIBUTION AND PROJECT TEAM MEMBER LIST....1

3. PLANNING AND PROBLEM DEFINITION....1

3.1 PROBLEM DEFINITION....1

3.2 SITE HISTORY AND BACKGROUND....1

3.3 CONTAMINANTS OF CONCERN/TARGET ANALYTES....1

4. PROJECT DESCRIPTION AND SCHEDULE....2

5. PROJECT QUALITY OBJECTIVES....2

5.1 PROJECT OBJECTIVES....2

5.2 MEASUREMENT AND PERFORMANCE CRITERIA....3

5.3 DATA QUALITY OBJECTIVES....3

6. SAMPLING DESIGN....3

6.1 SOIL SAMPLING....3

6.2 SAMPLE NUMBERING SYSTEM....4

6.3 MANAGEMENT OF INVESTIGATION-DERIVED WASTES....5

7. SAMPLING PROCEDURES....5

7.1 SAMPLING STANDARD OPERATING PROCEDURES....5

7.2 DECONTAMINATION PROCEDURES....5

8. SAMPLE HANDLING, TRACKING, AND CUSTODY PROCEDURES....5

9. FIELD ANALYTICAL METHODS AND PROCEDURES....6

9.1 FIELD ANALYTICAL METHODS AND STANDARD OPERATING PROCEDURES....6

9.2 FIELD TESTING LABORATORY....6

9.3 SCREENING/CONFIRMATORY ANALYSES....6

10. FIXED LABORATORY ANALYTICAL METHODS AND PROCEDURES....6

11. QUALITY CONTROL ACTIVITIES....6

11.1 FIELD QUALITY CONTROL....6

11.2 ANALYTICAL QUALITY CONTROL....6

11.3 PERFORMANCE EVALUATION SAMPLES....6

12. DOCUMENTATION, RECORDS, AND DATA MANAGEMENT....6

13. QUALITY ASSURANCE ASSESSMENT AND CORRECTIVE ACTIONS....7

TABLE OF CONTENTS (CONTINUED)

Section **Page**

14. REPORTS TO MANAGEMENT.....7

15. STEPS 1, 2 AND 3: DATA REVIEW REQUIREMENTS AND PROCEDURES.....7

LIST OF TABLES

Table 1 FSP Revision Form

Table 2 Sampling and Analysis Summary

LIST OF FIGURES

Figure 1 Site Location Map

Figure 2 Sample Location Map

LIST OF ATTACHMENTS

Attachment A – Field Collection Sheets

Attachment B – Standard Operating Procedures

1. INTRODUCTION

This Field Sampling Plan (FSP) identifies the data collection activities and associated quality assurance/quality control (QA/QC) measures specific to the Beck's Lake Site (the Site) located at LaSalle Park at the intersection of Washington and Falcon Streets in South Bend, St. Joseph County, Indiana. All data will be generated in accordance with the quality requirements described in the Weston Solutions, Inc. (WESTON®) *Superfund Technical Assessment and Response Team (START) III Generic Quality Assurance Project Plan (QAPP)*, dated June 2006. The purpose of this FSP is to describe site-specific tasks that will be performed in support of the stated objectives. The FSP will reference back to the QAPP for generic tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment and data review. Additional site-specific procedures and/or modifications to procedures described in the *START III Generic QAPP* are described in the following FSP elements.

This FSP is prepared, reviewed, and approved in accordance with the procedures detailed in the *START III Generic QAPP*. Any deviations or modifications to the approved FSP will be documented using Table 1: FSP Revision Form.

2. PROJECT MANAGEMENT AND FSP DISTRIBUTION AND PROJECT TEAM MEMBER LIST

Management of the Site will be as documented in the *START III Generic QAPP*. Refer to the *START III Generic QAPP* for an organizational chart, communication pathways, personnel responsibilities and qualifications, and special personnel training requirements.

The following personnel will be involved in planning and/or technical activities performed for this data collection activity. Each will receive a copy of the approved FSP. A copy of the FSP will also be retained in the Site file.

Personnel	Title	Organization	Phone Number	Email
Theresa Holz	OSC	EPA	312-886-6845	holz.theresa@epa.gov
Owen Thompson	RPM	EPA	312-886-4843	thompson.owen@epa.gov
Krista Richardson	Project Manager	START	847-918-4066	krista.richardson@westonsolutions.com
Jeff Bryniarski	Field Scientist	START	312-424-3307	jeff.bryniarski@westonsolutions.com
Tonya Balla	QA Reviewer / Health and Safety	START	847-918-4094	t.balla@westonsolutions.com

NOTES:
OSC – On-Scene Coordinator
QA – Quality Assurance
RPM – Remedial Project Manager
START – Superfund Technical Assessment and Response Team
U.S. EPA – U.S. Environmental Protection Agency

3. PLANNING AND PROBLEM DEFINITION

3.1 PROBLEM DEFINITION

The Indiana Department of Environmental Management (IDEM) conducted a Brownfields Environmental Assessment at the Site in October 2001. Arsenic was detected in soil samples at concentrations exceeding the IDEM Risk Based Closure Residential Default Closure Level of 3.9 milligrams per kilogram (mg/kg). In a letter dated October 22, 2010, IDEM requested that the U.S Environmental Protection Agency perform a site assessment.

EPA has tasked WESTON START with conducting a site assessment at the Site to evaluate the presence of metals in Site soil and determine if a Removal Action is warranted. The site assessment shall be conducted to determine the concentrations and extent of contaminants in soils and to determine whether the contamination poses an imminent risk to human health, welfare, and the environment.

3.2 SITE HISTORY AND BACKGROUND

The Site is located at the intersection of Washington and Falcon Streets in South Bend, St. Joseph County, Indiana (**Figure 1**). The Site is composed of an approximately 8-acre lake as part of the 40-acre LaSalle Park. LaSalle Park encompasses a baseball infield, soccer fields, recreational picnic areas, a parking lot and community center, playground areas with permanent equipment, and a significant area that serves as additional green space. The Site is bordered to the south and west by residential properties, to the north by wooded area and a quarry, and to the east by a light industrial property. The meridian coordinates of the Site are 41°40' 34.72" north latitude and 86°17'27.37" west longitude.

IDEM conducted a Brownfields Environmental Assessment of the Site in October 2001. This event included the collection of six on-site surface soil samples, four off-site surface soil samples, three sediment samples from Beck's Lake, three surface water samples from Beck's Lake, and one off-site background surface soil sample. Arsenic was detected in several soil/sediment samples at concentrations ranging from 4.8 mg/kg to 20.9 mg/kg exceeding the IDEM Risk Based Closure Residential Default Closure Level of 3.9 mg/kg.

In June 2003, IDEM conducted a Site Reassessment of the Site. During the reassessment, 22 surface soil samples were collected. Metals exceeding the site-specific background sample concentrations by three times included arsenic, lead, and chromium.

3.3 CONTAMINANTS OF CONCERN/TARGET ANALYTES

The contaminants of concern at the Site are metals with arsenic, lead, and chromium being the main chemicals of concern. Laboratory samples will be analyzed for:

Aluminum	Antimony	Arsenic	Barium	Beryllium
Cadmium	Calcium	Chromium	Cobalt	Copper
Iron	Lead	Magnesium	Manganese	Mercury
Nickel	Potassium	Selenium	Silver	Sodium
Thallium	Vanadium	Zinc		

4. PROJECT DESCRIPTION AND SCHEDULE

Site work is expected to be conducted in three days (including mobilization and demobilization from the Site). The site assessment will consist of a site reconnaissance and sample collection.

START will have two personnel performing the site assessment activities in modified Level D (reconnaissance and sampling activities) Personal Protective Equipment (PPE). The site assessment start date is June 11, 2013.

A WESTON-procured subcontracted laboratory will be utilized for analyses. The turnaround time for the preliminary sample data will be 10 calendar days. The sampling results will be reviewed and validated by a START chemist within seven days following receipt of the full data package. A summary report of the investigation sampling results will be submitted to EPA within two weeks of receipt of the validated data.

5. PROJECT QUALITY OBJECTIVES

5.1 PROJECT OBJECTIVES

The objective of the site assessment is to collect samples to evaluate potential threats to human health, human welfare, and the environment posed by current Site conditions. The objectives for this investigation include:

- Identify the constituents and/or characteristic properties of on-site soils;
- Determine if a removal action is warranted based on National Oil And Hazardous Substances Pollution Contingency Plan (NCP) criteria and, if so, whether the response should be classified as emergency, time-critical, or non-time critical;
- Rapidly assess and evaluate the urgency, magnitude, extent, and effects of a release, or threatened release, of hazardous substances, pollutants or contaminants identified and their affects on human health and/or the environment;
- Supply the Agency for Toxic Substances and Disease Registry (ATSDR) or others with information about the nature and magnitude of any health threats associated with the identified threats;
- Support subsequent public health advisories; and
- Determine a remedy to eliminate, reduce, or control risks to human health and the environment and to support an Action Memorandum documenting the identified removal approach.

Samples collected from the Site will be analyzed for the following:

- **Soil Samples** – Target analyte list (TAL) metals and hexavalent chromium [chromium(VI)]

The sampling results for soil samples will be compared to the U.S. EPA Removal Management Levels (RMLs) based on a target risk of 1E-4 and a hazard quotient (HQ) of 3.

5.2 MEASUREMENT AND PERFORMANCE CRITERIA

Generic measurement and performance criteria described in the *START III Generic QAPP* will be used to ensure that data are sufficiently sensitive, precise, accurate, and representative to support site decisions.

5.3 DATA QUALITY OBJECTIVES

Data quality objectives address requirements that include when, where, and how to collect samples, the number of samples, and the limits on tolerable error rates. These steps should periodically be revisited as new information about a problem is learned. Sections 4.0 and 6.0 address these objectives.

In addition, data quality objectives address the analytical screening levels to be used to make decisions. Surface soil samples collected will be analyzed for TAL metals and chromium(VI). The sampling results for surface soil samples will be compared to the U.S. EPA RMLs.

6. SAMPLING DESIGN

The site assessment will be performed June 11 – 13, 2013. WESTON START will perform the site assessment activities detailed in the following subsections.

Screening with an X-Ray Fluorescence Device (XRF) unit will be conducted on composite samples prior to allocating aliquot for off-site laboratory analysis.

6.1 SOIL SAMPLING

WESTON START will conduct soil sampling at each of the target areas of concern (AOC) of LaSalle Park; four soccer fields, one baseball infield; four playgrounds; and accessible areas surrounding Beck's Lake to identify soil with high concentrations of metals (specifically arsenic, lead, and chromium). An estimated total of 64 (58 investigative + 6 duplicate) soil samples will be collected for off-site laboratory analysis of TAL metals. One sample will be selected for laboratory analysis of chromium(VI) per AOC for a total of 11 (10 investigative + 1 duplicate) samples. Samples will be selected for chromium(VI) analysis based upon elevated XRF chromium results or by random selection. One surface soil sample (0-3 inches below ground surface [bgs]) will be collected at each sampling location. All sampling locations will be collected with a global positioning unit (GPS) unit.

Each of the four soccer fields will be divided into eight grids and one 5-point composite sample will be collected at each grid of each of the four soccer fields. Samples may also be selected at the 3-6 inches bgs interval as deemed necessary based on visual observations in the field if large divots are observed where there may be exposure to deeper soils.

The baseball field will be divided into three grids based on a pie shape and one 5-point composite sample will be collected from each grid for a total of three sampling locations.

An estimated five discrete or composite samples will be collected at each of the four playground areas for off-site laboratory analysis of TAL metals. An estimated three composite samples will be collected at areas surrounding Beck's Lake for off-site laboratory analysis of TAL metals.

Sampling locations will be selected in the field based on visual evidence of bare spots on each of the soccer fields and the baseball field, accessible areas surrounding Beck's Lake, and at high exposure areas of the playgrounds (e.g., under swings, at the end of the slides, etc.). For each sampling interval, the soil will be homogenized and placed in a Ziploc bag. The Ziploc bag will be marked clearly with the sample number, date, and time of collection.

XRF field screening will be conducted of each composite sample. The soil will be screened through the Ziploc bag and a one-minute analysis time will be employed for each sample. At least three readings will be collected for each sample. The XRF field screening results will be recorded in the Site logbook or on field data sheets (Attachment A).

Additional XRF readings may be collected from the grids if composite readings indicate elevated XRF readings that are not consistent with other nearby areas. Note that the RMLs are 39 mg/kg for arsenic, 400 mg/kg for lead, and 29 mg/kg for chromium(VI).

Sampling activities will be conducted in Level D PPE in accordance with the approved site-specific health and safety plan (HASP). WESTON START will don fresh sampling gloves at each sampling location. The surface soil will be collected using a dedicated disposable sampling scoop and/or a decontaminated stainless steel bucket auger. For each sampling interval, the soil will be homogenized in a dedicated disposable foil pan or Ziploc bag. A duplicate sample will be collected for one in every 10 samples. A matrix spike/matrix spike duplicate (MS/MSD) sample will be collected for one in every 20 samples. Any observations along with time, date and sample ID will be recorded in the Site logbook.

6.2 SAMPLE NUMBERING SYSTEM

All samples for analysis, including QC samples, will be given a unique sample number. The sample numbers will be recorded in the field logbook, the chain-of-custody (COC) paperwork, and the shipment documents.

START will assign each sample a project sample number. The project sample number highlights the suspected contaminated area and location, and will be used for documentation purposes in field logbooks, as well as for presentation of the analytical data in memoranda and reports. The project samples will be identified using the following format:

BL- XXYY(Z-Z)-mmddyy

Where:

- BL indicates that the sample is from the Beck's Lake Site
- XX indicates the "matrix" as follows: "SO" for soil
- YY indicates the sequential soil sampling location (01, 02, 03, etc.)
- ZZ indicates the sample depth in inches, if applicable
- mmddyy indicates the date

Field duplicate samples will be designated with a "D" suffix. Examples of the sample identifications for the Site are as follows:

- BLS- SO01(0-3)-061113: Beck's Lake Site; first soil sample location collected from 0-3 inches bgs; sample collected on June 11, 2013.
- BLS-SO02(0-3)-061113D: Beck's Lake Site; second soil sample location collected from 0-3 inches bgs; sample collected on June 11, 2013; duplicate sample.

6.3 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

For purposes of this FSP, investigation-derived wastes are defined as any byproduct of the field activities that is suspected or known to be contaminated with hazardous substances. The performance of field activities will produce waste products, such as spent sampling supplies (i.e.; scoops, foil pans), and expendable PPE (i.e.; gloves, booties). It is expected that disposable equipment will be used for most of the sample collection and therefore, no decontamination water will be generated. A distilled water and Alconox solution spray will be used for the hand auger equipment. All disposable waste generated during the site assessment will be placed in trash bags and disposed of as general refuse. If required, disposal arrangements will be executed in accordance with appropriate local, state, or federal regulations. START will refer to the EPA's *Management of Investigation-Derived Wastes During Site Inspections* (EPA, 1991) guidance on off-site disposal policies, if this action is deemed necessary.

7. SAMPLING PROCEDURES

7.1 SAMPLING STANDARD OPERATING PROCEDURES

The following standard operating procedures (SOPs) will be used during the site assessment with any necessary modifications that are needed (Attachment B):

- WESTON SOP 302 – Surface Soil

7.2 DECONTAMINATION PROCEDURES

General decontamination procedures are described in Section B.2 of the *START III Generic QAPP*. The following standard decontamination protocols will be used:

- All disposable sampling supplies and PPE will be bagged and staged on site in an area specified by EPA.
- Non-dedicated equipment, such as the hand auger, will be sprayed with an Alconox and distilled water solution.

8. SAMPLE HANDLING, TRACKING, AND CUSTODY PROCEDURES

All samples will be identified, handled, shipped, tracked, and maintained under COC, in accordance with *START III Generic QAPP* Section B.3.

9. FIELD ANALYTICAL METHODS AND PROCEDURES

9.1 FIELD ANALYTICAL METHODS AND STANDARD OPERATING PROCEDURES

Field analytical methods will not be employed during the site assessment

9.2 FIELD TESTING LABORATORY

A field testing laboratory is not anticipated at this time.

9.3 SCREENING/CONFIRMATORY ANALYSES

An Innov-X Handheld XRF unit will be utilized during soil sampling activities.

10. FIXED LABORATORY ANALYTICAL METHODS AND PROCEDURES

The soil samples collected from the Site will be analyzed by a WESTON-procured laboratory, Accutest Laboratories of New England, Marlborough, MA. The laboratory analytical methods and procedures are detailed in Table 2 of this FSP.

11. QUALITY CONTROL ACTIVITIES

11.1 FIELD QUALITY CONTROL

A duplicate XRF analysis will be conducted for one in every 10 samples.

11.2 ANALYTICAL QUALITY CONTROL

QC for analytical procedures will be performed at the frequency described in *START III Generic QAPP*, Tables 5 and 6. In addition, method-specific QC requirements will be used to ensure data quality.

11.3 PERFORMANCE EVALUATION SAMPLES

Standard reference material supplied with the XRF sampling device will be used to calibrate the monitor on a daily basis at the start of sampling and any time that accuracy or reproducibility of results becomes inconsistent. The Innov-X XRF has a three point calibration utilizing standard reference materials with known high, medium, and low concentrations of several elements.

12. DOCUMENTATION, RECORDS, AND DATA MANAGEMENT

Documentation, record keeping, and data management activities will be conducted in accordance with the *START III Generic QAPP*, Section B.10.

13. QUALITY ASSURANCE ASSESSMENT AND CORRECTIVE ACTIONS

No field audits will be conducted due to the short-term sampling activity.

14. REPORTS TO MANAGEMENT

Reports to management will be written and distributed in accordance with the *START III Generic QAPP,* Section C.

15. STEPS 1, 2 AND 3: DATA REVIEW REQUIREMENTS AND PROCEDURES

Step 1: Data collection activities, including sample collection and data generation, will be verified in accordance with the *START III Generic QAPP*, Section D.

Step 2: Data will be validated in accordance with the *START III Generic QAPP*, Section D.

A WESTON START chemist will validate the data. Definitive data will be validated following Tier Level II.

Step 3: Data will be reviewed for usability in accordance with the *START III Generic QAPP*, Section D.

TABLES

Table 1
FSP Revision Form

Site: Beck's Lake Health Risk SA, South Bend, St. Joseph County, Indiana
OSC: Theresa Holz
TDD: S05-0008-1305-021

Date	Rev. No.	Proposed Change to FSP/QAPP	Reason for Change of Scope/Procedures	FSP Section Superseded	Requested By	Approved By

Table 2
Sampling and Analysis Summary

Site: Beck's Lake Health Risk SA, South Bend, St. Joseph County, Indiana
OSC: Theresa Holz
TDD: S05-0008-1305-021

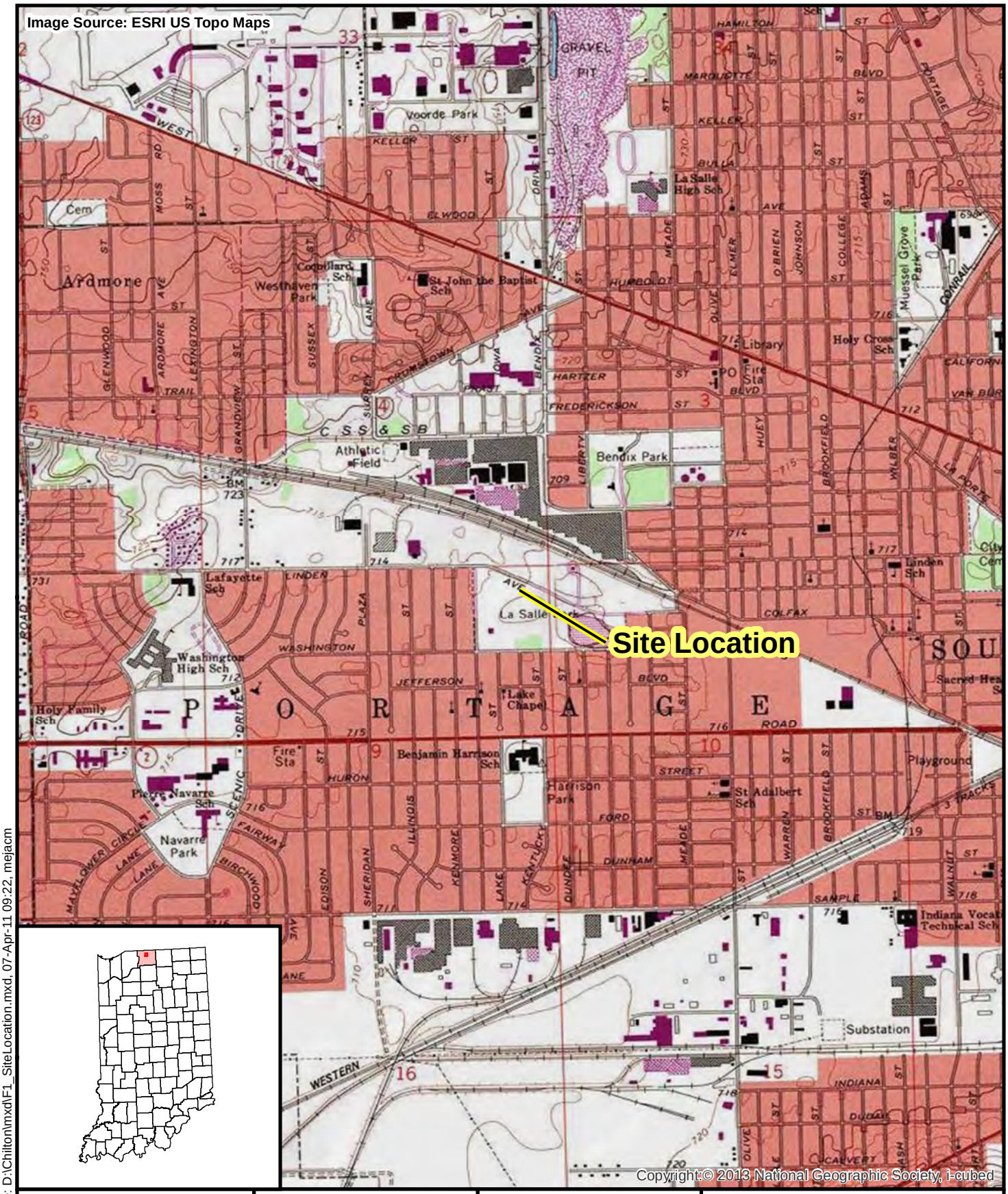
Matrix	Analytical Parameter	Analytical Method	Containers (Numbers, Size, and Type)	Preservation Requirements	No. of Sampling Locations	No. of Field Duplicate	No. of MS/MSD	No. of Trip Blank	Total No. of Samples to Lab	Holding Time
Surface Soil (0-3-inch bgs)	TAL Metals	SW846 6010B	(1) 8-ounce amber jar	Cool to 4°C	58	6	3	0	64	28 days for mercury, 6 months for the remaining metals
	Chromium (VI)	SW846 3060A/7196	(1) 8-ounce amber jar	Cool to 4°C	10	1	1	0	11	24 hrs for extraction, 30-days for analysis

Note:

Trip blanks are not required for metals samples.
Total number of samples to the laboratory does not include MS/MSD samples.

°C – Degrees Celsius
bgs – below ground surface
MS/MSD – Matrix Spike/Matrix Spike Duplicate

FIGURES



File: D:\Chilton\mxd\F1_SiteLocation.mxd, 07-Apr-11 09:22, mejacm

Legend

Site Boundary

N

0 2,000 Feet

Prepared for:
U.S. EPA REGION V

Contract No: EP-S5-06-04
TDD: S05-0008-1305-021
DCN: 2161-4H-BHHL

Prepared By:
WESTON SOLUTIONS, INC

750 E. Bunker Court
Suite 500
Vernon Hills, Illinois 60061

Figure 1
Site Location Map
Beck's Lake Health Risk SA
South Bend, St Joseph County, Indiana

Legend

- Baseball Diamond
- Lake AOC
- Playground
- Soccer Field
- Site Boundary

N

0 275 Feet

Prepared for:
U.S. EPA REGION V

Contract No: EP-S5-06-04
TDD: S05-0008-1305-021
DCN: 2161-4H-BHHL

Prepared By:
WESTON SOLUTIONS, INC
750 E. Bunker Court
Suite 500
Vernon Hills, Illinois 60061

Figure 2
Proposed Sampling Locations
Beck's Lake Health Risk SA
South Bend, St Joseph County, Indiana

FILE: D:\Becks_Lake_HRTA\mxd\F2_Prop_Sampling.mxd 2:27:14 PM 6/10/2013 mejacm

ATTACHMENT A

FIELD COLLECTION SHEETS

Field Data Collection Form
Beck's Lake Health Risk Site Assessment
South Bend, Indiana

Sample Location ID: _____

Location SOOCER FIELD PLAYGROUND BASEBALL FIELD LAKE

Sample Date: _____ **Sample Time**: _____

Sample Collected By: _____

Sample Observations (color, texture, odor, etc)

Overall: _____

Sample Type: DISCRETE COMPOSITE

Other Comments: _____

Analysis (all): TAL Metals Cr(VI)

Field duplicate: YES / NO

XRF Readings:

Reading #	Arsenic	Chromium	Lead
1			
2			
3			
4			

Other Comments: _____

_____

ATTACHMENT B

STANDARD OPERATING PROCEDURES

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 302

SURFACE SOIL SAMPLING

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Roy F. Weston, Inc. (WESTON®), Superfund Technical Assessment Response Team (START) members with a step-by-step guide for collecting representative surface soil samples using scoops and bucket augers.

2.0 MATERIALS REQUIRED

Below is a list of the materials needed for surface soil sampling events. Both dedicated and reusable sampling equipment are required.

- Personal protective equipment (as specified in the Health and Safety Plan)
- Sampling plan
- Maps/sketches
- Compass
- Tape measure (up to 300 ft)
- Survey flags/stakes
- Aluminum homogenization pans
- Sample jars
- Logbook
- Sample labels/tags
- Chain-of-custody forms and custody seals

- Field data sheets
- Coolers
- Ice
- Decontamination equipment (brushes, buckets, garden sprayer, phosphate-free soap, water, etc.)
- Ziploc® bags
- Plastic sheeting
- Paper towels
- Ball-point pen
- Permanent marker
- Grease pencil
- Marking spray paint
- Digital camera or a camera with film
- Air monitoring equipment [Micro FID, Multi RAE 5 Gas detector, etc.]
- Plastic sample scoops, if applicable
- Bucket auger, if applicable
- Thin-walled tube sampler, if applicable
- Plastic garbage bag
- Scissors

3.0 SAFETY PRECAUTIONS

Due to unknown constituents of the soil media, the exposure potential for personnel exists and must be of primary concern. Before any soil sampling is performed, a Health and Safety Plan (HASP) must be approved by the Regional Safety Officer.

1. Follow the HASP safety schedule.
2. Determine the appropriate levels of protection to be worn by personnel.
3. Conduct air monitoring in the breathing zones and screen the sample location holes once they are selected.

4. Ensure that equipment is properly decontaminated and in working condition prior to the mobilizing to the site.
5. Coordinate efforts and staffing with the client or agency with which you are working.

4.0 SAMPLING PROCEDURES

1. Perform a general site reconnaissance to verify actual site conditions consistent with the HASP.
2. Identify and mark all sampling locations using sample flags or stakes as specified in the sampling plan. *All sample locations should be measured, documented, and mapped in reference to a permanent marker, i.e. specified utility pole, benchmark, property marker, etc.*
3. Mark the pertinent site information in a site logbook and on field data sheets. *When large amounts of samples are collected, field data sheets allow for easy organization in addition to logbook entries.*
4. Make sure all sampling equipment is properly decontaminated prior to sampling.
5. Wear clean, disposable surgical gloves for each sampling location.
6. Begin sampling by cutting or pulling back debris with a stainless steel or dedicated plastic scoop.
7. Cover the sample location area with plastic sheeting if the soil has a high probability of contamination.
8. Continue cutting to the required depth. Generally, surface sampling is considered 0-3 inches below the surface. It is recommended sample holes be kept the same size diameter (suggested 6 inches) even when using scoops to keep samples relative to each other. Sample collection will focus on soil particles, not plant and tree roots, stones, rocks, concrete and other materials intermixed in the soil matrix.
9. If a grab sample is to be collected, transfer the sample volume directly into the sample container using a sampling device. *Check the preferred sampling apparatus list for various analytical parameters.* A grab sample pertains to a discreet depth or area in a given matrix.
10. Transfer the sample volume to a homogenization container if the sample is a composite sample or a pseudo-grab sample. A composite sample is a mixture of different depths, areas, and/or strata. Composite samples are not recommended for the collection of VOC samples because mixing causes volatile compounds to evaporate.
11. There are several homogenization techniques. The “quartering technique” requires the total volume of samples be divided into fourths inside the aluminum pan. Each quarter is then mixed individually, then the quarters are combined. This technique is repeated until a thorough mixing has occurred. The second method is the “bakers technique”, which simply entails

mixing the soil volume with hands covered by surgical gloves or sampling scoops. The "shake and bake technique" allows the cleanest mixing. This technique requires emptying the sample volume into a Ziploc® bag, sealing the bag, and then shaking the bag until the sample volume is thoroughly mixed. Note the qualities (color, texture, etc.) of the homogenized sample.

12. Place the sample in the designated sample container after the sample has been homogenized.
13. Label the sample container. Sample labels and tags are to be filled out with a permanent marker (*ball point pen ink bleeds when wet)*. Use a grease pencil to fill out labels and tags for samples to be analyzed for VOCs. Additionally, it is recommended that the bottom of the sample jar be marked with the time of collection, the sample location, and the sampler's initials, in case the labels are rendered illegible.
14. Place the sample jar into an appropriate sized Ziploc® bag.
15. Place the sample on ice, if applicable. Generally, soil samples do not require any preservative; however, unless told otherwise, it is always good practice to put samples on ice.
16. Decontaminate the sampling apparatus using the proper procedure (see Section 6.0 Decontamination of Sampling Equipment).
17. Complete the chain-of-custody form in a clear and concise manner.
18. Repeat steps 1-17 for each sample location.

5.0 SAMPLING DEVICES

Three common sampling devices used by START personnel include the sample scoop, the auger, and the thin-walled sampler/corer. The sample scoop includes both dedicated disposable plastic scoops and stainless steel scoops. Augers include bucket augers and hand augers. The thin-walled sampler/corer is the least used device of the three.

5.1 Scoops

Scoops make sampling quick and easy. Any time rough terrain is encountered, scoops are the ideal device. Generally disposable scoops are used because no wet decontamination is required. Never reuse dedicated scoops and always make sure proper decontamination has been performed for non-disposable sample scoops.

5.2 Bucket and Hand Augers

Augers are manually driven stainless steel sampling devices. The hand auger is a smaller version of the bucket auger. Augers tend to fluff sample volumes. Because of their design, augers are recommended for composite sampling. Augers are not recommended for VOC sampling because volatiles will be driven off.

5.2.1 Auger Sampling Procedures

1. Decontaminate augers before collecting first sample.
19. Cut a 12-inch hole in the plastic sheeting around sample location using scissors.
20. Discard debris and other surface material.
2. Place the auger perpendicular to the ground and twist the "T" handle in a clockwise rotation until the desired depth is achieved. To determine the depth of the sample measure the actual removed core or the depth of the newly bore hole.
3. Retrieve the specified sample volume. Any additional sample volume can be returned to the sample hole.
21. Place the sample volume into a homogenization pan and mix thoroughly.
22. Place the sample in the designated sample container. Note: Only VOA *containers are to be packed tightly.*
23. Label the sample container. Sample labels and tags are to be filled out with a permanent marker (*ball point pen ink bleeds when wet).* Use a grease pencil to fill out labels and tags for samples to be analyzed for VOCs. Additionally, it is recommended that the bottom of the sample jar be marked with the time of collection, the sample location, and the sampler's initials, in case the labels are rendered illegible.
4. Place the sample jar into an appropriate sized Ziploc® bag.
24. Place the sample on ice, if applicable. Generally, soil samples do not require any preservative; however, unless told otherwise, it is always good practice to put samples on ice.
25. Decontaminate the auger using the proper procedure (see Section 6.0 Decontamination of Sampling Equipment).
5. Complete the chain-of-custody form in a clear and concise manner.
26. Repeat steps 1-12 for each sample location.

Note: A major drawback for auger sampling is that roots, stones and other materials will not allow for good penetration. Different sample locations may have to be selected to collect samples.

5.3 Thin-Walled Sampler/Corer

The thin-walled sampler/corer is the least used of the common sampling devices. It works similar to an auger; however, it has a much smaller diameter and the core is visible from the side of the sampler barrel. This device is even more prone to refusal than the bucket auger. This device works well in moist soils with small grain sizes.

5.3.1 Corer Sampling Procedures

1. Decontaminate the augers before collecting the first sample.
27. Cut a 12-inch hole into plastic sheeting around sample location.
2. Discard debris and other surface material.
28. Place the thin-walled sampler perpendicular to the ground and twist the "T" handle in a clockwise rotation until desired depth is achieved.
29. Retrieve the specified sample volume. Any additional sample volume can be returned to the sample hole.
3. Place the sample volume into a homogenization pan and mix thoroughly.
4. Place the sample in the designated sample container.
5. Label the sample container. Sample labels and tags are to be filled out with a permanent marker only (*ball point pen ink bleeds when wet*). Use a grease pencil to fill out labels and tags for samples to be analyzed for VOCs. Additionally, it is recommended that the bottom of the sample jar be marked with the time of collection, the sample location, and the sampler's initials, in case the labels are rendered illegible.
6. Place the sample jar in an appropriate sized Ziploc® bag.
7. Place the sample on ice, if applicable. Generally, soil samples do not require any preservative; however, unless told otherwise, it is always good practice to put samples on ice.
8. Decontaminate the auger using the proper procedure (see Section 6.0 Decontamination of Sampling Equipment).
9. Complete the chain-of-custody form.
10. Repeat steps 1-12 for each sample location.

6.0 DECONTAMINATION OF SAMPLING EQUIPMENT

This procedure is arguably the most important step in sound sample collection. Poor decontamination will result in cross-contamination and inaccurate sample results. The adequacy of the decontamination is generally tested by daily rinsate blanks. The following procedures pertain to the three sampling devices noted in this SOP.

1. Determine an area to be used as a decontamination station and lay plastic sheeting down.
2. Fill and pressurize a garden sprayer with distilled water. Fill one decontamination bucket with distilled water and Alconox®. Fill and pressurize another garden sprayer (if available) with de-ionized water for the final rinse.
3. Brush off soil residue from the sampling device with a dry brush.
4. Quickly spray the sampling device with the garden sprayer to loosen the soil before placing the sampling device into the soapy water.

5. Put the sampling device into soapy water bucket. Remove soil residue with a long-handled brush, toilet brush or cleaning device. Spray off soap residue with distilled water.
6. Place the sampling device into another bucket and spray the sampling device thoroughly again with distilled water.
7. Final rinse the sampling device with de-ionized water. If solvents or weak acids are used for the final rinse, see START SOP No. 406, Investigative Derived Waste.
8. If stainless steel scoops are used, use multiple scoops so that decontamination does not have to be after every hole.
9. Repeat steps 1-7.
10. Contact the OSC to determine if decontaminated water may be dumped on site. Be sure to address this issue before the sampling event occurs. All PPE and other refuse generated can be disposed as solid industrial waste.

7.0 REFERENCES

EPA. 1991. *Compendium of Emergency Response Team (ERT) Soil Sampling and Surface Geophysic Procedures.* Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/006.

EPA 1991. *Removal Program Representative Sampling Guidance.* Volume 1 - Soil. Office of Solid Waste and Emergency Response, Washington, DC. 9630.4-10 P892-963408.

WESTON® (Roy F. Weston, Inc.) 1993. *Standard Practices Manuel for Soil Sampling With a Spade, Scoop and Stainless Surface Soil Sampler Auger and Tube Sampler.* West Chester, PA.

Attachment: 1

ATTACHMENT 1

SOIL SAMPLING DATA SHEET

Sample Number(s): _____

Date: _____

Time: _____

Soil Sampling Data Sheet

Site Name: _____ **Sampler:** _____

Sample Depth: ____ Surface (0-0.5 ft) _____ Shallow (0.5-5.0 ft)

Sample Method(Circle One):_____Scoop (2,3,4,5,6,7,8,A,C,+) ____ Hand Auger(2,3,4,5,6,7,B,+,-)

_____Slide-Hammer (1,2,3,4,5,6,7,8,A,B,+,-) ____ Open Tube (A,+,-)

_____Split/Solid Tube (1,2,3,4,5,6,7,8,A,B,-) ____ Thin-Wall Tube(8,A,-)

Preferred Methods

1 - Volatiles	5 - PCBs	A - Grab	+ - Surface
2 - Semi-Volatiles	6 - TPH	B - Composite (Vertical)	- - Shallow
3 - Primary Metals	7 - Rad	C - composite (Areal)	
4 - Pesticides	8 - Geotechnical		

Soil Description (Munsell): Chart _____ Value _____ Hue _____

Grain Size and Distribution: